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ABSTRACT

An analysis system was developed to facilitate the comprehensive analysis of over 800 hand-written mathematics, communications, and social studies lesson transcripts. The coding scheme facilitates the reduction of qualitative data into categorical data. The heart of the analysis system is the Dominant Instructional Event (DIE) which facilitates the further subdivision of each lesson into subcomponents labeled content, materials, groupings, interaction patterns, student activities, and cognitive taxonomic level. Trends are reported to illustrate the utility of the analysis system, however the paper focuses primarily on the methodology and the potential importance and estimated validity of the analysis system. (Author)

SESSION NUMBER 5.08

A SYSTEM FOR CODIFYING HANDWRITTEN LESSON TRANSCRIPTS FOR COMPREHENSIVE ANALYSIS

by
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A SYSTEM FOR CODIFYING HANDWRITTEN LESSON TRANSCRIPTS FOR COMPREHENSIVE ANALYSIS*

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I. Our Responsibility

During the summer of 1973, we were charged by the director of evaluation and documentation of the Experimental Schools Program (ESP) sponsored by the National Institute of Education to attempt to gain a comprehensive knowledge of the utilization of ESP funds for the purposes of curriculum and instruction in the school district we are studying. The Experimental Schools Program emphasizes a comprehensive change strategy, as opposed to one of piecemeal change, for the implementation of educational innovations. The Experimental Schools Program granted a great deal of autonomy to the district regarding how to define the project originally and how to execute it over the five years of its operation. Our external evaluation program is responsible for non-participant, summative evaluation (evaluation of the project as a whole, especially as to process and end results) while the district's internal evaluation department is committed to a participatory, formative evaluation stance (the use of evaluation to improve a program while it is in the process of being operationalized).

Our entire evaluation program, a unit composed of nine professional and three support staff members, is committed to an approach called "illuminative

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evaluation" whereby we address the questions: how are things done in the district? and why are they done the way they are done? as well as the question: with what impact? The basic methodology employed by our component, the Instructional Environment Component, is variously called ethnography, field-research, participant or non-participant observation, or qualitative research. In general, the methodology is an attempt to employ some of the fieldwork strategies of anthropological and sociological investigation to educational institutions and phenomena.

II. Sample Selection

We used a stratified random sampling process, with some variations,[1] which resulted in the observation of about 135 teachers. Each teacher was observed for four to five consecutive lessons[2] in the subject area for which that

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[1] One-fourth of the district's elementary teachers, stratified kindergarten through grade 3, grades 4 through 6, and by IGE (Individually Guided Education) school units, were randomly selected to be observed for both communications and mathematics instruction. One-fourth of the district's secondary teachers were randomly chosen by course responsibilities for either communications or mathematics streanf observations with the restriction that no secondary teacher would be chosen for more than two courses. One-fourth of all the kindergarten through grade 4 social studies classes in the district were chosen on a random basis, stratified by grade or level. One-half of all the fifth and sixth grade teachers were observed with emphasis on those involved with either of two innovative curricula being implemented; and one-half of all the junior and senior high school instructors were chosen, based on major responsibilities for each required social studies course.

[2] Bellack's study of the language of the classroom used four consecutive lessons. A. Bellack, et al., The Language of the Classroom, Teachers College Press, New York, Columbia University, 1966, p. 11. (Continued on next page)

teacher was chosen on the sample, a total of about 750 lessons. While consecutive observation periods raised some issues with regard to principles of time sampling (such as whether or not four consecutive days in November were necessarily the same as four in May, or the same as four separate days selected at random throughout the school year),[3] we felt that the necessity to build and

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(Continued from previous page) Smith and Meux scheduled five consecutive lessons. They also chose weeks unbroken by holidays or major school events and not too close to either end of a marking period. B. O. Smith and M. Meux, et al., A Study of the Logic of Teaching, Urbana, Illinois, University of Illinois Press, 1970, pp. 205 and 207. In a study of verbal classroom interaction, Wright and Proctor reported that after six consecutive observations subsequent data add little to that already collected. D. M. J. Wright and V. H. Proctor, Systematic Observation of Verbal Interaction as a Method of Comparing Mathematics Lessons, Cooperative Research Project No. 816, Office of Education, Washington, D.C., U.S. Department of Health, Education and Welfare, June 1961.

[3]Smith and Meux debated these same issues:

> The question of how much of a teacher's classroom discourse to record, and whether to concentrate the recording in a brief period of time or to distribute it over a month, semester, or year, is one which we considered at some length. It could be argued that spot recordings over a semester or year would be more representative of a teacher's work than an equal number of recordings taken consecutively. It would appear that spot recordings would tend to cancel out the effects of variations of content within a course and of changes in style of teaching from one topic to another. These are very cogent reasons. Nevertheless, we decided to make five consecutive recordings per teacher. For one thing, such recordings would provide continuity in the teaching of a topic over a period of days. In this way, we would obtain the sort of context useful in a logical analysis. For another thing, consecutive recording is easier to schedule and less disruptive of school routine. These are major considerations when the cooperation of a public school is being sought.

B. O. Smith, M. Meux, et al., A Study of the Logic of Teaching, Urbana, Illinois, University of Illinois Press, 1970, Appendix 1, pp. 205-206.

maintain rapport with staff was paramount for the type of information we wanted to collect, and that continuous observation was a much better vehicle for accomplishing this than visiting classes at monthly intervals.[4] In retrospect, this decision was wise, especially when placed in juxtaposition to what we were originally led to believe would be the initial ambivalences held by a sizable number of teachers about our presence.[5]

A rather long period of observation[6] was considered appropriate in order to establish the unobtrusive presence of the observers[7] as well as to

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[4]Medley and Mitzel recommend that it is helpful if teachers and observers mingle socially. D. M. Medley and H. E. Mitzel, "Measuring Classroom Behavior by Systematic Observation," in N. L. Gage (ed.), Handbook of Research on Teaching, Chicago, Rand McNally, 1963, p. 307.

[5]See also P. W. Jackson, Life in Classrooms, New York, Holt, Rinehart and Winston, 1968, pp. 131-133, regarding elementary teachers' qualms over the prospects of being observed too frequently. See also Medley and Mitzel, p. 247.

[6]Long in comparison to the "micro-approaches" to research on classroom instruction which tend to study a limited number of dimensions using time spans shorter than a lesson as the unit of analysis such as those found in A. Simon and E. G. Boyer (eds.), Mirrors for Behavior: An Anthology of Observation Instruments (17 vols.), Philadelphia, Pa., Research for Better Schools, Inc., 1970. Short, however, in comparison to Smith's one-semester study of Geoffrey's classroom, in L. M. Smith and W. Geoffrey, The Complexities of an Urban Classroom: An Analysis toward a General Theory of Teaching, New York, Holt, Rinehart and Winston, 1968.

[7]In a study of classroom interaction, Hudgins and Ahlbrand stopped the instruction in the secondary classrooms they were studying four times in a 50-minute class period to ask the students what they were thinking about. After the second response on the first day, the curve for responses concerning the presence of the researchers goes down rapidly. B. B. Hudgins and W. P. Ahlbrand, Jr., A Study of Classroom Interaction, Technical Report Series Number 8, St. Ann, Missouri, Central Midwest Regional Educational Laboratory, 1967.

An introductory letter to prospective participant secondary schools in Smith and Meux's study of the logic of teaching said: (Continued on next page)

assure the teachers of the observers' commitment to a comprehensive, naturalistic understanding of the teachers' procedures, to give the observers the opportunity to see the teachers in a variety of teaching postures, and to minimize the possibility that the teachers would "put on a show" for the observers.

The subject areas selected for observation were: mathematics, communications, and social studies. The mathematics and communications "streams"[8] were chosen because they were emphasized by the district as being part of a comprehensive kindergarten through grade 12 program, especially in the area of individualized instruction. Social studies stream instruction was chosen for observation because of the planned implementation of several elementary social studies programs during the 1973-74 school year.

III. Data Collection Procedures[9]

Three Instructional Environment personnel were assigned to monitor the classes selected in the sample. On the elementary level, two monitors

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(Continued from previous page)

> To record a class session requires two individuals to handle equipment and to record the non-verbal context of the proceedings. The project staff has found that the presence of these individuals (graduate students on the project staff) has created no discernible disturbance or disruption of classroom activity. After the first day, their presence was generally taken for-granted and the normal atmosphere of the class reasserted itself.

B. O. Smith, M. Meux, et al., p. 202.

In regard to his study of classroom interaction, Bellack states that "Although it cannot be assumed that the research procedures had no effect on the classroom behavior, it seems reasonable to conclude that this effect was minimal." Bellack, et al., p. 11.

[8]The district's six curricular streams are mathematics, communications, social studies, scientific, career education, and personal development.

[9]The type of data we collected will be made clear in section IV.

shared responsibilities for mathematics and communications instruction and the third had responsibility for the observation of social studies instruction. One person was assigned to each stream for the secondary observations. Mathematics and communications stream observations began on October 17, 1973, and ended on June 3, 1974, while social studies stream observations began on September 18, 1973, and were completed on June 4, 1974. Monitors generally attempted to complete the sample on a school-by-school basis, finishing the sample within each school before proceeding to the next school.[10]

Data were gathered by taking handwritten fieldnotes,[11] recording as many of the activities as possible of each teacher and class selected in the sample. We attempted to impress on teachers that we were not in their classrooms to evaluate their performance, but rather to describe their classroom activities as accurately as possible in the subject areas being studied.[12] As transcripts were taken, we gave teachers the option of seeing those transcripts if they so desired. Monitors made an effort to show teachers the transcript for the first day's observation and explained to them that they could peruse the rest

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[10]See the previous section on sample selection for our rationale for continuous observations rather than using some form of time sampling.

[11]Tape recording of lessons was considered, but deemed inappropriate, because of the potential threat to the teachers, the possible disruption of the instructional process, and the recognition that we would collect far more data than we would use.

[12]Medley and Mitzel, p. 307; Bellack, et al., p. 11; and Smith and Meux, et al., p. 206.

of the transcripts if they wished. In general, however, few teachers asked to see our subsequent transcripts.[13]

IV. Analysis System

As we approached the two-thirds point in our observations of mathematics, communications, and social studies stream instruction, we began to develop a scheme by which an analysis of our handwritten transcripts could be coded for later statistical analysis. A review of the research literature generally found extant instructional analysis schemes to lack the comprehensiveness we desired. Many such analysis schemes, especially the more popular ones such as those developed by Bellack, Flanders, or Withall, limit their foci to classroom interaction patterns; others are oriented toward the observation of specific ages or grade levels, unique curricular content, or previously defined teaching strategies.[14] Therefore we proceeded to develop a model for the analysis of instruction to act as an orderly method of reporting a sizable portion of the data in the approximately 750 lesson transcripts that we collected during the 1973-74 school year.

We will now proceed to explain this analysis system in terms of how "treatments" were defined, the character of the Dominant Instructional Event (DIE),

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[13] Medley and Mitzel speculate about the same lack of teacher interest in seeing the results of the data collection. Medley and Mitzel, p. 307.

[14] See B. Rosenshine and N. Furst, "The Use of Direct Observation to Study Teaching," in R. M. W. Travers (ed.), Second Handbook of Research on Teaching, Chicago, Rand McNally, 1973; R. Dreeben, "The School as a Workplace," in ibid., pp. 465-466; Simon and Boyer, 1970; R. T. Hyman, Teaching: Vantage Points for Study, New York, Lippincott, 1968; or Medley and Mitzel.

the nature of the six components of each DIE, and the general manner by which each lesson was coded.

A. Treatments

For purposes of analysis, basic curricular "treatments" in each stream were identified near the completion of the observations. The criteria that were considered in defining and/or naming curricular treatments included: (1) use of the same or similar curricular materials by a given teacher, (2) existence of the same or similar curricular materials in several settings, or (3) illustrating a relatively consistent approach to the subject-matter by different teachers. For example, in social studies, eight such "treatments" were identified.

We will use Exhibit A to help explain how our analysis system works.

B. Dominant Instructional Events

Our analysis system begins with the codification of Dominant Instructional Events (DIE's). DIE's are segments of lessons that possess an integrality of utilization of content, materials, groupings, interaction patterns, student activities, and cognitive level, preserve the arrangement by which the dimensions of these components occur in time, and are defined by the context of the "natural settings" of classroom instruction in which they occur.[15] The DIE is designed primarily as a heuristic device which facilitates the subdivision of lessons for further analysis.

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[15] See J. H. Burnett, "Event Description and Analysis in the Microethnography of Urban Classrooms," in F. A. J. Ianni and B. Storey (eds.), Cultural Relevance and Educational Issues, Boston, Little Brown, 1973, pp. 290-291.

Exhibit A

ANALYSIS OF SOCIAL STUDIES INSTRUCTION

Percent of Duration of DIE (min.)

Schools:

Grades:

N, Teachers: N, Lessons:

Avg. N, Students: Duration of Lessons (min.):

Avg. S/T: Avg. Duration of Lessons (min.):

Dominant Instructional Event (DIE)		New Content	Asgns.	Pract., Act.	Review, Testing	Lesson Totals
Number of DIE						
Duration of DIE (min.)						
Average Duration of DIE (min.)						
Range, Duration of DIE (min.)						
DIE (min.)/Lesson (min.)						
Content	Anthropology					
	Economics					
	Geography					
	History					
	Humanities					
	Political Science					
	Psychology					
	Sociology					
Materials	Basal Textbooks					
	Curriculum Pkgs.					
	Teacher-Dev.					
	Published Suppl.					
	Audio-Visual					
Groupings	Whole Class					
	Small Groups					
	Alone					
	Independent					
Interaction Patterns	Teacher Talk					
	T.-Initiated/S.					
	S.-Initiated/T.					
	S./S.					
	T./One S.					
	None					
Student Activities	Correcting					
	Test-Taking					
	Receiving					
	Reading					
	Mm.-Dr.; Smp. Rsp.					
	St. Gd., Ex., Quest.					
	Writing					
	Library Work					
	Problem-Solving					
	Pract./Art. Creat.					
	Discussion					
	Games, Sim., Plays					
Cognitive Level (percent of number of DIE)	Knowledge					
	Comprehension					
	Application					
	Analysis					
	Synthesis					
	Evaluation					

Four categories compose the DIE possibilities:

Presentation of new content: A segment of a lesson which introduces the student(s) to specific cognitive, affective, or psycho-motor content.

Practice or activities[16] derived from new content presentations or assignments: A lesson segment where the student(s) is(are) expected to practice or drill on content already presented to them or to participate in student activities designed to elaborate or sometimes to prepare the student(s) for content presentations.

Assignments: A lesson segment where the student(s) is (are) expected to complete a task or produce a product.

Review, evaluation, and testing: A lesson segment that repeats, measures, or corrects; includes "de-briefing" games, simulations, and role plays.[17]

We feel that these four possibilities include virtually all the possible instructional activities in any mathematics, social studies, or communications lesson. Each lesson can be divided into any combination of the four DIE categories. That which is not subsumable under these four headings includes such

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[16] "Practice" is more appropriate to DIE's in the mathematics and communications streams while "activities" is more applicable to social studies lessons.

[17] Our four DIE categories are similar to Flanders' identification of instructional activity periods, which are characterized by a major change in class formation, the communication pattern, or the subject under discussion. In an example, Flanders describes five such activity periods: (1) settling down to work, which we excluded from our analysis, (2) introducing new material, the same as our presentation of new content, (3) teacher-directed discussion or work on material that is not new, similar to our practice or activities, (4) supervision and direction of individual seatwork, comparable to our assignments DIE, and (5) periods of evaluation, in which homework and test results are discussed, containing part of what we call "review, evaluation, and testing." N. A. Flanders, Teacher Influence, Pupil Attitudes, and Achievement, Cooperative Research Monograph No. 12, Office of Education, Washington, D.C., U. S. Department of Health, Education and Welfare, 1965, pp. 19 and 22.

non-instructional activities as roll-taking, announcements, or closing activities, which are excluded from analysis in this system.

C. DIE Components and Dimensions

Each DIE is divided into six major components. The components are: content, materials, groupings, interaction patterns, student activities, and cognitive level. We feel that these components encompass a majority of the instructional activities that can occur within any one DIE, although other components can probably be added to our listing.

Each DIE component is subdivided further into from four to twelve dimensions. These dimensions are merely more specific delineations of each DIE component. For example, under the component labeled "interaction patterns," one can find a variety of interaction patterns possible. The possibilities listed--lecture and teacher talk, teacher-initiated/students, student-initiated/teacher, student/student, teacher/one student at a time, or none--further define the interaction pattern component.

In summary, then, lesson transcripts are divided first into DIE categories. Each category is further broken down into components consisting of a range of defining dimensions. We turn, now, to our definitions of components and dimensions.

Content is the first component of each DIE. Each stream has a unique listing of content dimensions, developed in order to enable us to categorize all the possible subject matter that can be taught in that curriculum stream. A listing of the social studies stream content dimensions is provided in Exhibit B.

The rest of the components are the same for all three streams.

Exhibit B

IBM

FORTRAN Coding Form

PROGRAM: ANALYSIS SYSTEM CODE SHEET

PROGRAMMER

DATE

PUNCHING INSTRUCTIONS: GRAPHIC / PUNCH

PAGE OF

CARD ELECTRO NUMBER*

GX28-7327-6 U/M 050
Printed in U.S.A.

STATEMENT NUMBER | CONT. | FORTRAN STATEMENT | IDENTIFICATION SEQUENCE

PRELIMINARY DATA

- SCHOOL
- GRADE
- TEACHER
- LESSON NUMBER
- NUMBER OF STUDENTS
- DURATION OF LESSON IN MINUTES

CURRICULUM

- OTHER ELEM: Teacher-developed
- OTHER ELEM: District
- CONCEPTS AND VALUES
- MAN: A COURSE OF STUDY
- PEOPLE AND TECHNOLOGY
- ESP SUPPLEMENTARY
- JUNIOR HIGH SCHOOL
- SENIOR HIGH SCHOOL

DIE

- PRESENTATION OF NEW CONTENT
- PRACTICE OR ACTIVITIES
- ASSIGNMENTS
- REVIEW, TESTING
- DURATION OF DIE IN MINUTES

CONTENT

- ANTHROPOLOGY
- ECONOMICS
- GEOGRAPHY
- HISTORY
- HUMANITIES
- POLITICAL SCIENCE
- PSYCHOLOGY
- SOCIOLOGY

MATERIALS

- BASAL TEXTBOOKS
- CURRICULUM PACKAGES
- TEACHER-DEVELOPED MATERIAL
- PUBLISHED SUPPL. MATERIAL
- AUDIO-VISUAL

GROUPINGS - INSTRUCTIONAL STRATEGIES

- WHOLE CLASS
- SMALL GROUPS
- ALONE
- INDEPENDENT

INSTRUCTION PATTERNS

- LECTURE-TEACHER TALK
- TEACHER-INITIATED/STUDENT
- STUDENT-INITIATED/TEACHER
- STUDENT/STUDENT
- TEACHER/ONE STUDENT
- NONE

STUDENT ACTIVITIES

- CORRECTING
- TEST-TAKING
- RECEIVING
- READING
- MEMORIZATION-DRILL; SIMPLE RESPONSES
- STUDY GUIDES
- WRITING
- LIBRARY WORK
- PROBLEM-SOLVING
- PRACTICAL OR ARTISTIC CREATIONS
- DISCUSSION
- GAMES, SIMULATIONS, PLAYS

COGNITIVE TAXONOMIC LEVEL

- KNOWLEDGE
- COMPREHENSION
- APPLICATION
- ANALYSIS
- SYNTHESIS
- EVALUATION

*A standard card form, IBM electro 888157, is available for punching statements from this form

**Number of forms per pad may vary slightly

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Materials refers to instructional software and hardware that can be expected to be found in any classroom. The materials component includes the following dimensions:

- Basal textbooks, possibly accompanied by student workbooks and teachers' manuals
- Curriculum packages, a relatively self-contained set of instructional materials consisting of audio-visual and/or manipulative as well as textual materials
- Teacher-developed materials, which can be basic or supplementary
- Published supplementary materials, including source materials as well as study guides or worksheets
- Audio-visual, including pictures, charts, maps, globes, transparencies, phonograph records, tape recordings, film strips, films, television programs, videotaped programs or activities, teaching machines, and guest speakers, but excluding use of chalk boards or overhead projectors

Groupings encompass the basic combinations by which students can be organized for instruction. The specific dimensions of the groupings component in our analysis system are:

- Whole class
- Small groups
- Alone, on an assignment required of the whole class
- Independent, working alone at the student's own rate on activities appropriate to each student's own needs, interests, or abilities

The interaction patterns component is composed of six dimensions that attempt to define all the possible interactions that can be found in any classroom. The six dimensions are:

- Lecture and teacher talk
- Teacher-initiated/student
- Student-initiated/teacher
- Student/student, including student presentations as well as discussion
- Teacher/one student at a time
- None

Student activities are defined as the general responses expected of students in order to facilitate their active participation in the learning process. Student activities include:

- Correcting one's own or other student's work
- Test-taking
- Receiving audio and/or visual inputs
- Reading, either orally or silently
- Memorization, drill, or simple response
- Completing study guides, exercises, or questions
- Library work, ranging from reference skills to research
- Writing, including paragraphs, essays, papers, stories, or poetry
- Problem-solving, including laboratory experiments
- Constructions, handicraft, practical creations, or artistic creations such as drawings, paintings, or sculptures
- Participation in discussion
- Participation in academic games, simulations, role plays, or plays

The final component is cognitive level.[18] The six cognitive levels include:

- Knowledge, or memory
- Comprehension
- Application
- Analysis
- Synthesis
- Evaluation

According to Bloom, and others, in the Taxonomy of Educational Objectives, the cognitive domain includes those objectives or outcomes that deal with the recall or recognition of knowledge and the development of intellectual abilities and skills. Although these dimensions are subdivided into finer elements in Bloom's

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[18] Based on B. S. Bloom (ed.), Taxonomy of Educational Objectives: The Classification of Educational Goals, Handbook I: Cognitive Domain, New York, David McKay Co., Inc., 1956.

taxonomy (each dimension has up to 12 subdivisions), we used only the broad dimensions because we were coding what we considered to be the actual behavior of the teachers and students we observed, a more gross level of analysis than that which could be performed in analysis of the intended behaviors as specified by the teachers' objectives. In addition, any such coding involved judgments of the instructional process, judgments which, if pushed to any finer level, would result in a specificity which would confound our ability to make meaningful generalizations.

V. Mechanics of Coding

Seven hundred and forty-seven transcripts were coded following the analysis scheme we have just described. Each observer analyzed only those transcripts that he or she had written. An inter-rater reliability of .90 was achieved among the three observers.[19]

Each lesson was analyzed as a separate entity. We first determined into which curricular treatment each lesson, or segment of a lesson, should be categorized. Next, after dividing the lesson into the appropriate number of DIE's, the "preliminary data" shown in Exhibit B were coded. Then, proceeding from left to right, the observer placed a one (1) in any column where that entry was present in the lesson. An exception was columns 25 and 26, "duration of DIE in minutes," where time was recorded instead.

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[19]See the Appendix for a discussion of our measure of inter-rater reliability.

Exhibit C represents how one of the 33 Fortran coding forms for the analysis of social studies instruction looked upon completion. Proceeding across line seven of Exhibit C, we find that at School 8 in grade 5 (coded 11), teacher 36 taught 30 students for [redacted] minutes in Man: A Course of Study (column 16). The presentation of new content DIE (column 21) lasted 30 minutes (columns 25, 26) and covered anthropology (column 27) using a curriculum package (column 36). Teacher-initiated interaction (column 41) dominated the DIE. The DIE was taught in a whole class grouping (column 46) where the students were receiving (column 52) and giving simple responses (column 54) at the cognitive level of knowledge (column 62).

In this example, you will notice that two student activities were coded for one DIE: receiving and simple responses. In order to allow the natural setting to be accurately reflected in our analysis, we coded any dimensions that occurred, regardless of the number of entries for that component. For cognitive level, however, we only allowed one entry per DIE. This is so because we coded the most complex dimension reached during any DIE for the cognitive level component.

Finally, upon the completion of the coding of all lessons, the data were combined into tables like Exhibit A based upon similarity of treatment. This last procedure involved two steps. Given an indication of presence or absence, we first figured the proportion of each DIE accounted for by any one dimension. This proportion was derived by dividing the recorded number of DIE dimensions by the frequency of DIE categories. Thus, if the DIE category labeled presentation of new content occurred 30 times in a given treatment, and basal texts were

Exhibit C

IBM FORTRAN Coding Form

GX28-7327-6 U/M 050** 17
Printed in U.S.A.

PROGRAM	SOCIAL STUDIES; MAN: A COURSE OF STUDY			PUNCHING INSTRUCTIONS	GRAPHIC									PAGE 3 OF 7
PROGRAMMER	Robert Toepper	DATE	7/9/74		PUNCH									CARD ELECTRO NUMBER

C	STATEMENT NUMBER	CONT	FORTRAN STATEMENT	IDENTIFICATION SEQUENCE
0	5113	5	3300 55	1 1 2 3 1 1 1 1 1 1 1 1 1
0	5113	5	3300 55	1 1 1 9 1 1 1 1 1 1
0	5113	5	3300 55	1 1 1 3 1 1 1 1 1 1
0	5113	5	4310 43	1 1 4 3 1 1 1 1 1 1 1
0	5113	5	5320 25	1 1 1 8 1 1 1 1 1 1 1
0	5113	5	5320 25	1 1 0 7 1 1 1 1 1 1
0	8113	6	1300 64	1 1 3 0 1 1 1 1 1 1
0	8113	6	1280 64	1 1 3 4 1 1 1 1 1 1
0	8113	6	2310 69	1 1 2 0 1 1 1 1 1 1
0	8113	6	2310 69	1 1 1 8 1 1 1 1 1 1
0	8113	6	2310 69	1 1 3 1 1 1 1 1 1 1
0	8113	6	3330 67	1 1 1 9 1 1 1 1 1 1
0	8113	6	3330 67	1 1 4 8 1 1 1 1 1 1
0	8113	6	4290 59	1 1 1 8 1 1 1 1 1 1
0	8113	6	4290 59	1 1 1 0 1 1 1 1 1 1
0	8113	6	4290 59	1 1 0 7 1 1 1 1 1 1
0	8113	6	4290 59	1 1 0 7 1 1 1 1 1 1
0	8113	6	4290 59	1 1 1 7 1 1 1 1 1 1
0	9113	7	1300 42	1 1 0 8 1 1 1 1 1 1
0	9113	7	1300 42	1 1 1 4 1 1 1 1 1 1
0	9113	7	1300 42	1 1 1 2 1 1 1 1 1 1
0	9113	7	1300 42	1 1 0 8 1 1 1 1 1 1
0	9113	7	2280 46	1 1 1 2 1 1 1 1 1 1
0	9113	7	2280 46	1 1 3 4 1 1 1 1 1 1

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*A standard card form IBM electro 888 57, is available for punching statements from this form

**Number of forms per pad may vary slightly

used three times in those DIE's, then we could say that ten percent of the presentation of new content DIE's for that treatment used basal texts.

In a similar manner, by using the time duration of each DIE in minutes of columns 25 and 26 on Exhibit B, and substituting it for all the "ones" recorded for that DIE entry, we arrived at a percentage that indicated the amount of time in minutes accounted for by any DIE category. Thus, in the example described before, if the 30 DIE's totaled 900 minutes and the three uses of basal texts totaled 100 minutes, then we could say that 11 percent of the presentation of new content DIE's for that treatment used basal texts. Referring to Exhibit A, you will notice that we used percentage of time in the analysis of all components except cognitive level where we used percentage of the DIE's.

VI. Some Findings

We turn now to a brief summary of some of our findings in order to illustrate the utility of our analysis system.

One of the potential contributions of our analysis system to knowledge of the instructional process is the finding that assignments DIE's had a different character than the other three DIE categories. This can be readily seen in the analysis of social studies instruction, but the concept also was applicable to the mathematics and communications analyses.

Assignments DIE's, the more student-oriented DIE's, represented 32 percent of the instruction in the 309 social studies lessons analyzed. Assignments, which were generally required of the whole class, tended to be completed alone (62 percent) or in small groups (37 percent) utilizing student/student (37 percent)

or no (25 percent) interaction patterns or an interaction pattern where the teachers conversed with individual students (50 percent) as they worked. Assignment DIE's tended to de-emphasize knowledge goals (52 percent of the DIE's) in favor of comprehension (16 percent of the DIE's) and the other more complex cognitive levels (31 percent of the DIE's).

For the other three DIE's, 68 percent of the social studies instruction observed, classes were taught as whole groups (87 percent) using teacher-initiated interaction patterns (57 percent) with knowledge (76 percent of the DIE's) as the primary cognitive outcome.

In addition, the major findings concerning some of the social studies treatments indicated that:

1. Two nationally-developed curriculum packages by the same developers, Man: A Course of Study (MACOS) for fifth grade students and People and Technology (PAT) for sixth graders, were found to facilitate the more complex cognitive levels more consistently than any other social studies curricula used in the district under study (respectively, 44 and 44 percent of the DIE's were coded at or above the comprehension level).

2. Primary teachers tended to develop their own social studies curricular and instructional materials rather than to follow the plan of organization of published textbooks or curriculum packages. One consequence of this approach was a heavy emphasis on knowledge goals (92 percent of the DIE's).

3. Senior high school social studies teachers, even though they used a sizable amount of teacher-developed materials (49 percent of the time), were able to move above knowledge objectives to approximately the same proportions

as MACOS and PAT (47 percent of the DIE's were coded at or above the comprehension level).

VII. Conclusion

The establishment of trends from a large amount of qualitative data is an extremely cumbersome and difficult task. The specific use of our analysis scheme is to enable researchers or evaluators to reduce a mass of qualitative data into a manageable form (categorical data) so that instruction can be described more precisely than when one attempts to proceed directly from qualitative data. While the stage is set for more systematic quantitative analyses, the richness of qualitative data for indepth description and analysis is also maintained. The analysis system we have described enables us to convert the outputs of qualitative analysis to inputs (independent variables) for the more traditional quantitative models which test the effect of treatments on outcomes.

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APPENDIX: INTER-RATER RELIABILITY

Three samples of inter-rater reliability were conducted to ascertain the three observers' ability to use our analysis system to code their handwritten transcripts in a similar fashion. Each observer coded the same lesson transcript. Then the percent of times each pair of observers tallied the units identically was computed using the formula:

$$\text{percent agreement} = \frac{\text{number of units of data tallied identically}}{\text{total number of units of data in reliability sample}}$$

Each sample was required to have at least 100 units of data.[1]

The first two reliability samples were conducted in a span of about four days near the beginning of the coding process. The first sample used two typewritten, verbatim, elementary social studies transcripts collected by one of the observers several years ago. When the first sample was taken each observer had coded three of his or her own transcripts. After extensive discussion, each observer then rechecked the three original transcripts and continued on. The second sample used a handwritten elementary mathematics transcript taken in the district as part of the mathematics sample. The third sample utilized a handwritten secondary communications transcript also collected as part of the communications sample in the district. By the time the third sample was taken, the observers had coded 41, 49, and 32 percent, respectively, of his or her own transcripts. The table on this page illustrates the percent agreement of the three coders.

PERCENT AGREEMENT OF THREE CODERS USING A SYSTEM FOR CODIFYING HANDWRITTEN LESSON TRANSCRIPTS FOR COMPREHENSIVE ANALYSIS

Transcript	Subject	#1, #2	#2, #3	#1, #3	Average
1	SS	88.5	86.2	81.0	85.2
2	M	91.8	91.0	87.7	90.2
3	C	92.3	95.4	93.8	93.8
Average	---	90.9	90.9	87.5	89.7

[1] D. J. Fox, The Research Process in Education, New York, Holt, Rinehart and Winston, 1969, pp. 365-67.